

Appendix 1

Protocol Overviews and Data Forms

Lentic Site Survey Protocol for Amphibians and Aquatic Reptiles

What is a survey location and what is a survey?

Each lentic site (standing water body) is a survey location and each person surveying the site is considered an independent survey of the site.

Selection of Survey Locations

All standing water bodies present within each QQuad grid cell on 1:24k scale topographic maps or found incidentally while in the field should be surveyed if they are safely accessible and on public land or are on private lands where you have received permission to survey these sites. If no standing water bodies are found on the topographic maps, accessible lands should be ground truthed by driving roads or hiking major trails to examine areas of low topographic relief or backwaters of streams that might provide lentic breeding habitat. If there are too many standing water bodies to survey within the 3 days allocated to each QQuad grid cell, then those likely to have more suitable habitat should be prioritized for survey over springs and wells.

Survey Methodology

Use timed visual encounter and dip net surveys in all portions of the water bodies that are less than 50 cm in depth. If little emergent vegetation is present then careful examination of these shallow water environments for the presence of eggs, larvae, or post metamorphic animals may suffice. However, in areas with dense emergent vegetation, it will be necessary to intensely sample the area with a dip net. At sites where water depths drop off steeply from the shoreline, visual searches and dip netting may be performed from the shoreline. However, areas with extensive shallows will require systematic searches and dip netting while wading through the area on evenly spaced transects. Note that occupancy analysis assumes that surveys are independent and do not influence one another with regard to the detection of various life history stages of species, so be sure to take steps to ensure that surveyors do not influence one another. If ill or dying animals are encountered at a site, place individual animals in individual zip lock bags and keep them on ice so that they can be shipped to a pathologist for analysis. Collect voucher specimens of amphibians and reptiles if the record fills in a significant hole or extends the species' known range or if species identity is uncertain (e.g., toad tadpoles in eastern MT).

Data and Photographs

Data sheets should be filled out thoroughly and care should be taken to ensure that data recorded is consistent with the site drawing and all related data fields (see description sheet for all datasheet fields). Record all detections by individual surveyors on the lower back of the datasheet. However, the front of the datasheet should only include a summary of the greatest numbers of animals observed for an individual life history stage for each species detected. Lentic sites within a 200-meter radius of mapped sites should be lumped under the same data sheet. Digital photographs of each site should be taken from a vantage point that allows the entire site to be seen in the context of surrounding habitats. Ideally only a single photograph will be needed. However, if multiple photographs are necessary, they should be labeled a, b, c, etc. as viewed from left to right. Each lentic site surveyed should be labeled on the QQuad map as A-01, A-02, etc..

Washing and Decontamination Procedures

In order to prevent the spread of fungal and viral pathogens, care should be taken to wash mud, aquatic vegetation, and other materials off of dip nets, boots, socks, and other equipment prior to departing from a site. Survey gear should be left to dry in the sun for as long as possible between sites. Dip nets, boots, socks, and other survey equipment should be decontaminated with a mixture of 10% bleach (4 ounces or one half cup) per gallon of water) between all Quarter Quadrangle grid cells, sites where dead, dying, or ill animals are encountered, and sites on different sides of divides separating major drainage basins. This can be accomplished by washing gear in tubs or by simply spraying washed gear down with pressurized sprayer containing 10% bleach and allowing it to dry in the sun. Do not rinse bleached equipment between sites. Instead allow the bleach to remain on the equipment to ensure that pathogens are killed. Most bleach will evaporate between sites so the amount of bleach introduced at the next site should be quickly diluted.

Nocturnal Auditory Amphibian Survey Protocol

When to Perform Surveys

Nocturnal auditory surveys for amphibians are conducted along passable roadways to rapidly add new localities and monitor amphibian species that are cryptic and/or occur less frequently on public lands. The majority of amphibians of interest for calling surveys in eastern Montana will call after and during rains on warmer spring and summer evenings.

Survey Methodology

Call surveys involve slowly driving roads in the evening and nights immediately following or during significant rainfall events while listening for species' breeding calls. Vehicles should be stopped every mile or two in low lying areas suitable for containing pooled water; a GPS unit may be of assistance in locating stream crossings or water bodies most likely to contain suitable habitat. At each stop observers should listen for species' breeding calls for 5 minutes without interference from vehicle noise before moving on. The location of each stop is noted on standard data forms and at each stop where species are detected, the compass bearing and distance to the breeding choruses is documented; likely breeding sites are subsequently identified in the office using digital topographic maps and high resolution aerial photographs. Starting point, ending point, and survey route are recorded in the comments in order for these survey routes to be digitized in the office.

Terrestrial Reptile Survey Protocol

What is a survey location and what is a survey?

Each rock outcrop or coulee rim is a survey location and each person surveying each survey location is considered an independent survey. If a rock outcrop or coulee rim is extremely large then it can be broken into multiple survey locations smaller than 400 x 100 meters based on natural breaks such as a drainage or area with reduced amounts of cover objects. If rock outcrops or coulee rims are not present within a Quarter Quadrangle grid cell then transects through a dominant cover type may be substituted as survey locations.

Selection of Survey Locations

Potential rock outcrops within each Quarter Quadrangle grid cell should be identified on 1:24,000 scale topographic maps by locating areas with greater amounts of topographic relief such as cliff faces. These areas often constitute boundaries between substrate types that differ in their erodibility. Rock strata in these areas may allow access to underground chambers that serve as hibernacula or may have collapsed to provide cover objects. These areas should be targeted for survey based on: (1) their accessibility on public land or are on private lands where you have received permission from the land owners to survey sites; (2) size of the likely rock outcrop (the larger the size, the better); and (3) the aspect of the survey location (south facing sites should be a higher priority for survey than north facing sites). Field crews should attempt to survey 4 or more rock outcrops per Quarter Quadrangle grid cell if time allows.

Survey Methodology

Occupancy analysis assumes that surveys are independent and do not influence one another with regard to the detection of species, so be sure to take steps to ensure that surveyors do not influence one another. Begin by coordinating with other surveyors on which portion of each rock outcrop you intend to survey in order to minimize overlap in area surveyed. Use timed visual encounter surveys in all portions of the rock outcrop by slowly moving through the area. Visually examine rocks at distances of up to 15 meters as well as near your feet. Lift cover-objects taking care to keep the cover object between you and species potentially sheltering under the cover object. Use potato rakes to probe rock crevices while listening and watching for animal movements. Use write-in-rain notebooks to note times at first detection and incidental observations of other animals.

Data and Photographs

Data sheets should be filled out thoroughly and care should be taken to ensure that data recorded is consistent with the site drawing and all related data fields (see description sheet for all datasheet fields). Record all detections by individual surveyors on the lower back of the datasheet. However, the front of the datasheet should only include a summary of the total numbers of animals observed for each species detected; if the same area is surveyed by multiple individuals then the greatest number of animals observed for each species detected should be recorded. Digital photographs of each site should be taken from a vantage point that allows the entire site to be seen in the context of surrounding habitats. Ideally only a single photograph will be needed. However, if multiple photographs are necessary, they should be labeled a, b, c, etc. as viewed from left to right. Finally, the outer boundary of the area surveyed should be drawn on the QQuad topographic maps in order to facilitate digitizing the site boundary in the GIS; each site should be labeled as R-01, R-02, í etc..

Preventing the Spread of Weeds

In order to prevent the spread of weeds, care should be taken to remove weed seeds from boots, socks, packs, and other field gear between sites. Weed seeds should also be removed from grills, radiators, and under carriages of vehicles whenever possible.

Bat Acoustic Detection Protocol

What is a survey location and what is a survey?

Each location where an individual Petterson Detector and I-River MP3 recorder is set out is a survey location and each night of acoustic recording is a survey.

Selection of Survey Locations

Effort should be made to sample each of the major habitat cover types within each Quarter Quadrangle grid cell and ideally each major cover type should be sampled in multiple locations. Prioritize survey locations for acoustic survey in order to: (1) represent all major cover types; (2) survey locations that are readily accessible on public land or are on private lands where you have received permission from the land owners to survey sites; (3) if all cover types have been sampled then add additional survey locations in native cover types over human altered cover types and add additional survey locations in wetland cover types versus terrestrial cover types; and (4) whenever possible please sample cover type patches that are relatively large in size (e.g., place detectors inside the edge of a habitat cover type by 100 meters or more). It may be necessary to sample the same location on multiple nights due access limitations or concerns over hazardous weather conditions that could damage detectors, but this should be kept to a minimum. Detectors should be spaced a minimum of 400 meters apart in order to ensure independence between surveys.

Survey Methodology

Detectors and MP3 recorders should be set out each night in weather proof containers mounted on top of conduit mounted on rebar pounded into the ground as an anchor point. Again, detectors should be spaced a minimum of 400-meters apart in order to ensure independence between surveys. If a major thunderstorm is predicted for the region you are working in you may not want to set out detectors until after the storm passes in order to avoid damaging this expensive equipment. Settings on detectors and MP3 recorders are outlined in detail in a photographic guide that should be followed rigorously each time detectors are set out. Prior to deploying the detectors check the batteries in both the detectors and the MP3 recorders ó be sure to recharge the H320 MP3 recorders daily. Make sure that the detector is recording before you leave (test it with finger snaps if there are no bats in the area yet). Detectors should be collected each morning as soon as possible. Guidelines for downloading detectors are outlined in detail in a photographic guide that should be followed rigorously each time detectors are downloaded.

Data and Photographs

Data sheets should be filled out thoroughly with comments on the surrounding habitat for each location a detector is set out. Digital photographs of each site should be taken from a vantage point that allows the detector to be seen in the context of the surrounding habitat. Ideally only a single photograph will be needed. However, if multiple photographs are necessary, they should be labeled a, b, c, etc. as viewed from left to right. Each site where detectors are set out should be labeled on the QQuad map as B-01, B-02, ...etc..

Preventing the Spread of Weeds

In order to prevent the spread of weeds, care should be taken to remove weed seeds from boots, socks, packs, and other field gear between sites. Weed seeds should also be removed from grills, radiators, and under carriages of vehicles whenever possible.

Small Mammal Trap Line Protocol

What is a survey location and what is a survey?

Each trap line is a survey location and each night of trapping on each trap line is a survey.

Selection of Survey Locations

Within each Quarter Quadrangle grid cell target a riparian cover type and the two most dominant habitat cover types within for survey. However, if the two most dominant habitat cover types are both extensively modified by humans (e.g., hay field and cropland), only survey one of these. Additionally, survey locations should be prioritized for survey based on: (1) their accessibility on public land or are on private lands where you have received permission from the land owners to survey; (2) the size of the cover type patch (large patches should be sampled whenever possible to reduce confusion as to which cover type a species is associated with).

Trap Line Orientation and Setting Traps

Trap lines should be oriented in habitat cover type patches so that they are relatively consistent in their habitat structure. Each line is 100-meters long and composed of 10 stations, each spaced 10-meters apart. Each station has 1 Victor mouse trap, 1 Museum Special, 1 pitfall trap, and 1 Sherman trap and station numbers 2 and 9 also have a rat trap (see diagram below). Trap lines do not have to be straight and can be placed in an arc in order to remain in a single habitat cover type. When laying out trap lines, one person can pace out the site, beginning with a flag to facilitate relocation of the trap line, and drop traps and pitfalls at 10-meter intervals. The second person should dig pitfall traps taking care to place them flush with the ground so that animals are not alerted to their presence; when possible, pitfall traps should be placed to take advantage of natural fences in the terrain like logs, rocks and drainages. After the first person has laid out the trap line, they should bait and set the snap and Sherman traps. Snap traps are baited with a peanut butter and sweet feed mix and Sherman traps are baited only with sweet feed mix to keep the trigger devices clean. Snap and Sherman traps should be placed in natural runways approximately 1-meter from the central pitfall trap rather than at an exact right angles as indicated in the example diagram below. Be sure to test and adjust the tension on the Sherman trigger plates each day since the trigger sensitivity changes with temperature and needs to be kept as sensitive as possible in order to capture smaller animals like shrews. Traps should only be set in the evenings.

Checking Traps and Processing Animals

All traps need to be checked daily as early as possible to minimize animal stress and mortality. Traps should all be sprung and left closed each morning in order to prevent incidental mortalities of non-target species during the day. In order to ensure that surveyors do not contract diseases, latex gloves and HEPA masks should be worn at all times when handling live and dead animals and checking traps and hand sanitizer should be used after handling traps. To check Sherman traps with live captures, place a bag over the trap opening and shake the animal into the bag. The animal can then be weighed in the bag and manipulated for measurement. Leather gloves should be used when handling a live specimen for measurement and release. The following measurements should be recorded for the first two specimens of each species: weight in grams (use smallest scale possible), total length (nose to tail tip, excluding hairs extending beyond tail), tail length, hind foot (include claws), ear length, and sex. To allow for identification of possible recaptures, the hairs on the back of live animals should be clipped in an easily identified straight line. If previously marked animals are filling Sherman traps each night, please note this on the datasheet.

Euthanization and Museum Voucher Specimens

The following should be kept as museum voucher specimens within each Quarter Quadrangle grid cell: (1) only the first specimen of deer mouse, montane vole, and meadow vole; (2) all snap trap captures of all other species, regardless of number captured; (3) all shrews (euthanize any live shrews); (4) any animal for which species identity is uncertain (euthanize animals if necessary); (5) one example of each species captured (euthanize live animals if they haven't already been captured in a snap trap). To euthanize live or injured animals place a

cotton-ball dabbed with a small amount of isoflurane into the opposite corner of the bag until 15 or more minutes after the animal has stopped breathing. Vouchered specimens should be placed in an individual zip lock bag with a fully completed museum voucher tags (use the following date format 6 25 May 2009). All specimens from each trap line should then be placed in a larger bag labeled with the trap line (site) name and number and Quarter Quadrangle grid cell name and number. After the three nights of trapping in a Quarter Quadrangle grid cell, place all bags from each trap line in a bag labeled with the Quarter Quadrangle grid cell name and number. Immediately after traps are checked, voucher specimens should be placed on ice or in a refrigerator.

Data and Photographs

Data sheets should be filled out thoroughly with comments on the surrounding habitat for each trap line. Digital photographs of each trap line should be taken from a vantage point that allows the trap line flags to be seen in the context of the surrounding habitat. Ideally only a single photograph will be needed. However, if multiple photographs are necessary, they should be labeled a, b, c, etc. as viewed from left to right. Each trap line should be labeled on the QQuad map as M-01, M-02, etc..

Preventing the Spread of Weeds

In order to prevent the spread of weeds, care should be taken to remove weed seeds from boots, socks, packs, and other field gear between sites. Weed seeds should also be removed from grills, radiators, and under carriages of vehicles whenever possible.

Site Data Form for Lentic Breeding Amphibian and Aquatic Reptile Surveys

Locality Information

Date		Observer(s)		Owner		Site Detection: Aerial Photo Topo Map NWI Map Incidental				GPS EPE	
DM Region SE MONTANA		QQUAD		Site Number		State		County		Map Name	
Locality						T		R		S	
Map Elevation		Datum		Latitude (DD)		Longitude (DD)				Survey Type 0 1 2 3 4 5 6 7 8	

Habitat Information

Begin Time		End Time		Total Person Minutes of Search				Site Overview Photo Taken <input type="checkbox"/> Photo Description(s)					
Site Dry: Y N		Site Origin: Beaver Water Depressional Manmade Other _____						Support Reproduction? Y N		GIS Mapping 0 1 2 3 4 5 6 7			
Habitat Type:		Lake/ Pond	Wetland/ Marsh	Bog/ Fen	Backwater/ Oxbow	Spring/ Seep	Active Beaver Pond	Inactive Beaver Pond	Site Multipooled	Ditch/ Puddle	Reservoir/ Stockpond	Well/ Tank	
Weather: Clear Partly Cloudy Overcast Rain Snow				Wind: Calm Light Strong		Air Temp °C		Water Temp °C		Water pH			
Color: Clear Stained		Turbidity: Clear Cloudy		Water Connectedness: Permanent Temporary Isolated		Water Permanence: Permanent Temporary		Max Depth: < 1 M 1-2 M >2 M		Percent of Site > 2 M 0 1-25 26-50 51-75 76-100			
Site Length:		Site Width:		Percentage of Site Searched: 1-25 26-50 51-75 76-100		Percent of Site at ≤ 50 cm Depth: 0 1-25 26-50 51-75 76-100				~ Emergent Veg Area (M ²)			
Percent of Site with Emergent Veg: 0 1-25 26-50 51-75 76-100				Percent of Site with Larval Activity: 0 1-25 26-50 51-75 76-100				Rank Emergent Vegetation Species in Order of Abundance: Sedges Grasses Cattails Rushes Water Lily Shrubs Other					
Primary Substrate of Shallows: Silt/Mud Sand Gravel Cobble Boulder/Bedrock				North Shoreline Characteristics: Shallows Present: Y N Emergent Veg Present: Y N					Distance (M) to Forest Edge:				
Grazing Impact None Light Heavy Structure Heavy Structure and Water Heavy Water						Water Dammed/Diverted Y N		Timber Harvest in Area Y N		Mining Activity Y N			
Other Human Impacts Or Modifications:						Fish Detected? Y N		Time at First Detection:		Fish Species If Identified:			
Fish Spawning Habitat Present? Y N U				Inlet Width:		Inlet Depth:		Inlet Substrate		Outlet Width		Outlet Depth	

Species Information

Amphibian Species		Time at first detection	E L M J A	No. Egg Masses		5-20mm larvae	≤10 ≤100 ≤1000 ≤10K >10K				
20-50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	>50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	Number Juveniles		Number Adults					
Tissue Number		Voucher Number		Breeding with Fish?	Y N	If breeding with fish is cover present?	Y N				
Amphibian Species		Time at first detection	E L M J A	No. Egg Masses		5-20mm larvae	≤10 ≤100 ≤1000 ≤10K >10K				
20-50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	>50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	Number Juveniles		Number Adults					
Tissue Number		Voucher Number		Breeding with Fish?	Y N	If breeding with fish is cover present?	Y N				
Amphibian Species		Time at first detection	E L M J A	No. Egg Masses		5-20mm larvae	≤10 ≤100 ≤1000 ≤10K >10K				
20-50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	>50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	Number Juveniles		Number Adults					
Tissue Number		Voucher Number		Breeding with Fish?	Y N	If breeding with fish is cover present?	Y N				
Amphibian Species		Time at first detection	E L M J A	No. Egg Masses		5-20mm larvae	≤10 ≤100 ≤1000 ≤10K >10K				
20-50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	>50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	Number Juveniles		Number Adults					
Tissue Number		Voucher Number		Breeding with Fish?	Y N	If breeding with fish is cover present?	Y N				
Reptile Species		Time at first detection	E J A	Number Individuals		SVL in CM		Tissue Number		Voucher Number	
Reptile Species		Time at first detection	E J A	Number Individuals		SVL in CM		Tissue Number		Voucher Number	
Reptile Species		Time at first detection	E J A	Number Individuals		SVL in CM		Tissue Number		Voucher Number	
Reptile Species		Time at first detection	E J A	Number Individuals		SVL in CM		Tissue Number		Voucher Number	

Definitions of Variables on Lentic Breeding Amphibian Survey Data Sheet

Locality Information

Date: Use MM-DD-YY format (e.g. 5/12/00 for May 12 of 2000).

Observers: List names or initials of individuals involved with survey of this site and circle the name of the recorder.

Owner: Use abbreviation of the government agency responsible for managing the land you surveyed. (e.g. USFS, BLM). If private land was surveyed list the owner's full name to indicate that you did not trespass.

Site Detection: Was site detected on aerial photo, topographic map, NWI map, or was it observed incidentally while in the field.

GPS EPE: The estimated positional error reported by the GPS receiver in meters.

Strata Number: The sample strata in which the 6th level HUC watershed lies (one of nine defined in western Montana).

HUC Number: The sample number of the 6th level HUC in one of the nine sample strata defined for western Montana.

Site Number: The number pre-assigned to the water body within each 6th level HUC. If the water body was not pre-assigned a number because it was not on topographic maps or aerial photos then assign it a sequential number and draw it on the topo map.

State: Use the two-letter abbreviation.

County: Use the full county name.

Map Name: List the name of the USGS 7.5-minute (1:24,000 scale) topographic quadrangle map.

Locality: Describe the specific geographic location of the site so that the type of site is described and the straight-line air distance from one or more permanent features on a 7.5-minute (1:24,000 scale) topographic map records the position of the site (e.g., Beaver pond, 1.5 miles south of Elephant Peak and 1.3 miles east of Engle Peak).

T: Record the Township number and whether it is north or south.

R: Record the Range number and whether it is east or west.

S: Record the Section number.

Section Description: Describe the location of the site at the ¼ of ¼ section level (e.g., SENE indicates SE corner of NE corner).

Map Elevation: The elevation of the site as indicated by the topographic map in feet (avoid using elevations from a GPS)

UTM Zone: Universal Transverse Mercator zone recorded on the topographic map. Use NAD 27 as the map and GPS datum.

UTM North: Universal Transverse Mercator northing coordinate in meters as recorded on the topographic map or GPS receiver. Be sure to note any major differences between UTM coordinates on the map and those on the GPS receiver.

UTM East: Universal Transverse Mercator easting coordinate in meters as recorded on the topographic map or GPS receiver. Be sure to note any major differences between UTM coordinates on the map and those on the GPS receiver.

Survey Type: Circle the appropriate number defined as follows: 0 = private land so site was not surveyed; 1 = site not surveyed due to logistics; 2 = site is a lotic spring/seep not worth future survey; 3 = lentic site that is worth future survey; 4 = misidentified as a potential lentic site on the aerial photograph or on the topographic map (e.g., a shadow from a tree or a talus slope) and not worth future survey; 5 = inactive beaver dam that now only has lotic habitat and is not worth future survey; 6 = only lotic habitat is present and the site is not worth future survey, but it appears possible that the meadow was an historic beaver dam complex; 7 = a lentic site because it would hold water for at least a short time period during wetter conditions, but it is not worth future survey because it would never hold enough water long enough to support amphibian reproduction; 8 = site is not worth future survey for some reason other than those listed above.

Habitat Information

Begin Time: List the time the survey began in 24-hour format.

End Time: List the time the survey ended in 24-hour format.

Total Person Minutes of Search: Record the total person minutes the site was searched (e.g. if one person surveys for 15 minutes and another surveys for 30 minutes, but takes 5 minutes to measure a specimen the total person minutes is 40 minutes).

Camera and Photo Number(s) / Description (s): Identify the camera and the number of the photo as viewed on the camera's view screen and a description of the contents of the photograph (e.g., 13 = 1 x ASMO larvae and 14 = 1 x habitat). Take photos of all portions of the site and anything else that may be of interest (e.g., areas with fish versus areas with amphibians).

Site Dry: Circle whether the site was dry or not at the time of the survey.

Site Origin: Circle whether the site origin is glacial, beaver, water (i.e., flooding or spring), depressional, manmade, or describe other origin.

Support Reproduction: Is site capable of supporting reproduction so it is worth resurveying (e.g. in wetter years if now dry)?

GIS Mapping: Circle the appropriate number defined as follows: 0 = site not surveyed; 1 = a 4 in the survey type and site is not worth future survey; 2 = a 2, 5, 6, or 8 in survey type and site is not worth future survey; 3 = 7 in survey type and site is not worth future survey; 4 = a 3 in the survey type and site is dry, but is worth future survey; 5 = a 3 in the survey type and site has ephemeral water and is worth future survey (including high elevation sites that freeze solid); 6 = a 3 in the survey type, site is worth future survey, has emergent vegetation, and has permanent water that lasts all summer long and does not freeze solid in the winter so that it is likely to support aquatic overwintering; 7 = a 3 in the survey type, site is worth future survey, does not have functional amounts of emergent vegetation, and has permanent water that lasts all summer long and does not freeze solid in the winter so that it is likely to support aquatic overwintering.

Habitat Type: Circle the appropriate habitat type of the site being surveyed. If site is multi-pooled water information does not need to be gathered for every pool, but you may wish to record this information on the map. If breeding activity is limited to one pool at a multi-pooled site water information should be recorded for this pool and this should be noted in the comments.

Weather: Circle weather condition during survey.

Wind: Circle wind condition during survey (> 20 mph winds should be classified as strong).

Air Temp: Record air temperature at chest height in the shade. Record temperature in Celsius. °C = (°F – 32)/1.8

Water Temp: Record water temperature where larvae or egg masses are observed or at 2 cm depth 1 meter from the margin of the water body. Record temperature in Celsius. °C = (°F – 32)/1.8

Water pH: Record water pH at the same location water temperature was recorded.

Color: Circle whether the water is clear or stained a tea or rust color from organic acids.

Turbidity: Circle whether water is clear or cloudy.

Water Connectedness: Circle if water body has permanent connection to flowing water (Permanent), is connected to flowing water for a temporary period each year (Temporary), or is never connected to flowing waters or other water bodies (Isolated).

Water Permanence: Circle whether the site contains water throughout the entire year (Permanent), or contains water for only a portion of the year (Temporary).

Max Depth: Circle the category corresponding to the maximum depth of the water body.

Percent of Site > 2 M: Circle the percentage of the site with water depth greater than 2 meters deep.

Site Length: The length of the longest dimension of the standing water body.

Site Width: The width of the second longest dimension of the standing water body.

Percentage of Site Searched: Circle the percentage of the site surveyed.

Percentage of the Site at ≤ 50 cm Depth: Circle the appropriate percentage.

Approximate Area with Emergent Veg (M^2): The approximate area of the site that contains emergent vegetation.

Percentage of Site with Emergent Veg: Circle the percentage of the entire site with emergent vegetation.

Percentage of Site with Larval Activity: Circle the percentage of the site where amphibian larvae were observed.

Rank Emergent Veg Species in Order of Abundance: Record the rank order of abundance in front of the 3 most prevalent emergent vegetation species. If the vegetation present is “other” indicate what it is.

Primary Substrate: Circle the substrate that covers the majority of the bottom of the site.

North Shoreline Characteristics: Circle whether shallows and emergent vegetation are present or absent on the north shoreline.

Distance (M) to Forest Edge: Record the closest distance between the water’s edge and the forest margin in meters.

Grazing Impact: Circle the appropriate grazing category defined as follows: no grazing in vicinity of the site; grazing noted in the vicinity of the site, but no major impacts to wetland structure or water quality; heavy structural impacts to site (e.g., vegetation destroyed creating bare ground, hummocks, pugging, or altered hydroregime); heavy structural impacts and water quality impacted due to animal waste; and water quality impacted due to animal waste.

Water Dammed/Diverted: Circle whether or not water has been dammed or diverted at the site (including blow outs or pits).

Timber Harvest: Circle whether or not timber has been harvested within 200 meters of the site.

Mining Activity: Circle whether or not there is evidence of mining activity within 200 meters of the site.

Other Human Impacts or Modifications: Briefly describe if, how, and when the site has been altered by human activities. If the site has not been altered record none for not altered. If multiple anthropogenic impacts exist document all of these using the back of the data sheet if necessary and qualify approximate timing of impact (e.g., recent versus historic).

Fish Detected?: Circle whether or not fish were detected.

Time at First Detection: If fish were detected, indicate the time in total person minutes of survey when they were first detected.

Fish Species if Identified: List the fish species identified.

Fish Spawning Habitat Present?: Are shallow waters with adequate gravels/cobbles present that would allow salmonid fishes to spawn? An active search for fry is also a good idea.

Inlet Width: What is the average width of the inlet stream in meters?

Inlet Depth: What is the average depth of the inlet stream in centimeters?

Inlet Substrate: What is the primary substrate at the inlet stream (Silt/Mud, Sand, Gravel, Cobble, or Boulder/Bedrock)?

Outlet Width: What is the average width of the outlet stream in meters?

Outlet Depth: What is the average depth of the outlet stream in centimeters?

Outlet Substrate: What is the primary substrate at the outlet stream (Silt/Mud, Sand, Gravel, Cobble, or Boulder/Bedrock)?

Species Information

For each species record the first two letters of the scientific genus and species names for all amphibian and reptile species found at the site (e.g., BUBO for *Bufo boreas*). Record the total number of person minutes of survey required before each life history stage of each species was encountered beside the E (egg), L (larvae), M (metamorph), J (juvenile), or A (adult). Record the number or category of number of each of the specified life history and/or size classes. For amphibians indicate whether they have bred in the same water body where fish are present, and if they have, indicate whether there is protective cover (e.g., extensive shallows with emergent vegetation, a log barrier, talus). Record the tissue number or range of tissue numbers for tissue samples collected (see tissue collection protocols). If the animal was swabbed in preparation for testing the animal for chytrid infection indicate the chytrid sample number in the Tissue Number field. Record the preliminary museum voucher specimen number for voucher specimens collected (see voucher specimen collection protocols).

Site Map for Lentic Breeding Amphibian and Aquatic Reptile Surveys

General: Include a rough sketch of the site including the shape of the site and the shape and spatial relations of surrounding biotic and abiotic features. Indicate the area covered with emergent vegetation with cross-hatching. Indicate a 2-meter depth contour for the water body with a dashed line. Indicate the location where the water temperature was taken, the location where the GPS position was taken, the location where clinometer readings for southern exposure were taken, and the location of any photographs with an arrow indicating the direction in which the photo(s) were taken. Make sure that the orientation of the sketch (i.e. the north arrow) corresponds to the orientation of the site.

Grid Scale: Indicate the approximate scale of the grid lines relative to the site sketched in meters.

Other Notes: Include any other notes of interest in this space. Examples: (1) areas of highest larval density; (2) thoughts on why a species may not have been detected at a site; (3) problems associated with the survey of the site (e.g., dangerous boggy conditions); (4) If a site was dry would it support reproduction during wetter years.

Southern Exposure: From a site on along the northern shoreline that would most likely to be used as an oviposition or larval rearing area (e.g., shallow waters with emergent vegetation in the NW corner of the water body) record the degree inclination from your position to the skyline (e.g., mountain or solid tree line) at each of the eight compass bearings listed. Note that the compass bearings are true north so you will need to adjust your compass according to the map being used to correct for the deviation from magnetic north (15 to 19.5 degrees in western Montana).

Data Form for Reptile Site Surveys

Locality Information

DM Region SE MONTANA	QQUAD	Site No:	Locality:			
State:	County:	Map Name:	T	R	S	Section Description:
Owner:	Map Elevation:	FT	Datum	Latitude (DD)		Longitude (DD)

Habitat Information

Date:	Observer(s):	Begin Time:	End Time:	Total Person Minutes of Search:	Area (M ²) Searched:	
Percentage of Site Searched: 1-25 26-50 51-75 76-100		Percent Slope:	Aspect: N NE NW S SE SW E W Flat			
Habitat Cover Type As Percent of Site Surveyed:						
Cliff/Outcrop		Bluff/Coulee Rim	Talus	Open Conifer Forest	Open Mixed Forest	Shrub/Steppe
Grassland		Other _____				
%		%	%	%	%	%
Site Overview Photo Taken <input type="checkbox"/>				Air Temp: °C		Soil Temp: °C
Photo Description(s)				Weather: Clear Partly Cloudy Overcast Rain Snow		Wind: Calm Light Strong
				Potential Hibernaculum Y N		
Soil Moisture: Dry Damp Wet Standing Water Snow		Dominant Substrate Type: Bedrock Compressed Soil Sand Detritus Gravel (<4 cm diameter) Cobble (4-30cm diameter) Boulder (>30 cm diameter)				
Habitat Description/Threats:						

Reptile Species Information

Species:	Number and Time at First Detection (e.g., 2 x juveniles, 25 cm TL @ 10 minutes)	Cover Type at Animal's Location:
Tissue Number (e.g., MTHP5533)	Substrate Association of Animal (Circle):	
Voucher Number & Description:	under wood on/under 4-20cm rock fragments on/under >20cm rock fragments in vegetation on leaf litter in rock fracture Other _____	
Species:	Number and Time at First Detection (e.g., 2 x juveniles, 25 cm TL @ 10 minutes)	Cover Type at Animal's Location:
Tissue Number (e.g., MTHP5533)	Substrate Association of Animal (Circle):	
Voucher Number & Description:	under wood on/under 4-20cm rock fragments on/under >20cm rock fragments in vegetation on leaf litter in rock fracture Other _____	
Species:	Number and Time at First Detection (e.g., 2 x juveniles, 25 cm TL @ 10 minutes)	Cover Type at Animal's Location:
Tissue Number (e.g., MTHP5533)	Substrate Association of Animal (Circle):	
Voucher Number & Description:	under wood on/under 4-20cm rock fragments on/under >20cm rock fragments in vegetation on leaf litter in rock fracture Other _____	
Species:	Number and Time at First Detection (e.g., 2 x juveniles, 25 cm TL @ 10 minutes)	Cover Type at Animal's Location:
Tissue Number (e.g., MTHP5533)	Substrate Association of Animal (Circle):	
Voucher Number & Description:	under wood on/under 4-20cm rock fragments on/under >20cm rock fragments in vegetation on leaf litter in rock fracture Other _____	

Grid Scale:

A blank grid with a compass rose in the top right corner. The compass rose consists of a large 'N' and an upward-pointing arrow, indicating North is towards the top of the grid. The grid is composed of 15 columns and 15 rows of squares.

* Draw a rough sketch of the site labeling major features such as cliffs, talus slopes, and all habitat cover types. Be sure to indicate where animals were detected and label the following locations on the map: **G** = GPS reading, - - - - - = area surveyed, and **P**➔ = photo locations and directions of photos.

Other Notes:

Detection Summary (list surveyors in left column and species detections in others (e.g., 1 @ 5 min))

Surveyor						

Definitions of Variables on Reptile Site Survey Form

Site Information

Strata Number: The sample strata in which the 6th level HUC watershed lies.

HUC Number: The sample number of the 6th level HUC.

Site No: Identify three digit number of the site being surveyed within each sampling block (range 001-999).

Locality: Describe the specific geographic location of the site so that the type of site is described and the straight-line air distance from one or more permanent features on a 7.5-minute (1:24,000 scale) topographic map records the position of the site (e.g., Large talus slope 1.5 miles north of Engle Peak, N side of FS Road 225).

State: Use the two-letter abbreviation.

County: Use the full county name.

Map Name: List the name of the USGS 7.5-minute (1:24,000 scale) topographic quadrangle map.

T: Record the Township number and whether it is north or south.

R: Record the Range number and whether it is east or west.

S: Record the Section number

Section Description: Describe location of the site at the ¼ of ¼ section level (e.g., SENE indicates SE corner of NE corner).

Owner: Use abbreviation of the government agency responsible for managing the land you surveyed. (e.g. USFS, BLM). If private land was surveyed list the owner's full name to indicate that you did not trespass.

Map Elevation: The elevation of the site as indicated by the topographic map in feet (avoid using elevations from a GPS)

Datum: The map datum used (typically NAD 27 if off topographic map or WGS84 if off GPS unit on standard setting).

UTM Zone: Universal Transverse Mercator zone recorded on the topographic map.

UTM East: Universal Transverse Mercator easting coordinate in meters as recorded on the topographic map or GPS receiver. Be sure to note any major differences between UTM coordinates on the map and those on the GPS receiver.

UTM North: Universal Transverse Mercator northing coordinate in meters as recorded on the topographic map or GPS receiver. Be sure to note any major differences between UTM coordinates on the map and those on the GPS receiver.

Survey Information

Date: Use MM-DD-YY format (e.g. 05/12/00 for May 12 of 2000).

Observers: List names or initials of individuals involved with survey of this site and circle the name of the recorder.

Begin Time: List the time the survey began in 24-hour format.

End Time: List the time the survey ended in 24-hour format.

Total Person Minutes of Search: Record the total person minutes the site was searched (e.g. if one person surveys for 15 minutes and another surveys for 30 minutes, but takes 5 minutes to measure a specimen the total person minutes is 40 minutes).

Area (M²) Searched: Area in square meters that was surveyed.

Percent of Site Searched: Circle the appropriate category.

Percent Slope: Percent slope of site. Enter range if variable.

Aspect: Circle primary aspect of the site.

Habitat Cover Type as Percent of Site Surveyed: Identify percent composition of each habitat type within site surveyed.

Photo Frame Number(s) / Descriptions: The number of the photo as viewed on the camera's view screen and a description of the contents of the photograph (e.g., #13 = 1 x Milksnake and #14-18 = 5 x habitat). Take photos of all portions of the site and anything else that may be of interest (e.g., reptile species, potential site threats).

Air Temp: Record air temperature in °C at chest height in the shade. °C = (°F – 32)/1.8

Soil Temp: Record soil temperature in °C at 10 cm depth. °C = (°F – 32)/1.8

Weather: Circle weather condition during survey.

Wind: Circle wind condition during survey (> 20 mph winds should be classified as strong).

Potential Hibernacula: Does the site contain suitable underground refugia (e.g., talus, caves) to support overwintering.

Soil Moisture: Circle the appropriate category.

Dominant Substrate Type: Circle the appropriate category.

Habitat Description/Threats: Note the most prominent characteristics of the site with relation to reptiles (e.g., could the site support overwintering). Also note habitat threats from grazing, logging, mining, flooding, road building, weeds, fire, etc.

Species Information

For each species record the first two letters of the scientific genus and species names for all amphibian and reptile species found at the site (e.g., COCO for *Coluber constrictor*). Record the total number of person minutes of survey required before each life history stage of each species was encountered and the size or size range of the animals encountered. Record the tissue number or range of tissue numbers for tissue samples collected (see tissue collection protocols). Record the preliminary museum voucher specimen number for voucher specimens collected (see voucher specimen collection protocols). Circle the substrate the animal was associated with at time of detection. Record the presence of other species detected at the site (e.g., millipedes), the time at first detection, and the voucher number and description of animals collected (see voucher and tissue collection protocols)

Bat Acoustic Survey Form												
QQuad Name/ Observer(s)												
QQUAD Bat Acoustic Survey Comments												
Survey #		Date	Location			Latitude (DD)		Longitude (DD)		Photo Y / N		Weather
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]												
Recorder ID		Time/Temp Deployed/Collected and other comments:										
Survey #		Date	Location			Latitude (DD)		Longitude (DD)		Photo Y / N		Weather
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]												
Recorder ID		Time/Temp Deployed/Collected and other comments:										
Survey #		Date	Location			Latitude (DD)		Longitude (DD)		Photo Y / N		Weather
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]												
Recorder ID		Time/Temp Deployed/Collected and other comments:										
Survey #		Date	Location			Latitude (DD)		Longitude (DD)		Photo Y / N		Weather
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]												
Recorder ID		Time/Temp Deployed/Collected and other comments:										
Survey #		Date	Location			Latitude (DD)		Longitude (DD)		Photo Y / N		Weather
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]												
Recorder ID		Time/Temp Deployed/Collected and other comments:										
Survey #		Date	Location			Latitude (DD)		Longitude (DD)		Photo Y / N		Weather
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]												
Recorder ID		Time/Temp Deployed/Collected and other comments:										
Survey #		Date	Location			Latitude (DD)		Longitude (DD)		Photo Y / N		Weather
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]												
Recorder ID		Time/Temp Deployed/Collected and other comments:										

Bat Acoustic Survey Form Page 2										QQUAD									
Survey #		Date		Location						Latitude (DD)				Photo Y / N					
										Longitude (DD)				Weather					
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]																			
Recorder ID		Time/Temp Deployed/Collected and other comments:																	
Survey #		Date		Location						Latitude (DD)				Photo Y / N					
										Longitude (DD)				Weather					
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]																			
Survey #		Date		Location						Latitude (DD)				Photo Y / N					
										Longitude (DD)				Weather					
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]																			
Recorder ID		Time/Temp Deployed/Collected and other comments:																	
Survey #		Date		Location						Latitude (DD)				Photo Y / N					
										Longitude (DD)				Weather					
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]																			
Recorder ID		Time/Temp Deployed/Collected and other comments:																	
Survey #		Date		Location						Latitude (DD)				Photo Y / N					
										Longitude (DD)				Weather					
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]																			
Recorder ID		Time/Temp Deployed/Collected and other comments:																	
Survey #		Date		Location						Latitude (DD)				Photo Y / N					
										Longitude (DD)				Weather					
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]																			
Recorder ID		Time/Temp Deployed/Collected and other comments:																	
Survey #		Date		Location						Latitude (DD)				Photo Y / N					
										Longitude (DD)				Weather					
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]																			
Recorder ID		Time/Temp Deployed/Collected and other comments:																	
Survey #		Date		Location						Latitude (DD)				Photo Y / N					
										Longitude (DD)				Weather					
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]																			
Recorder ID		Time/Temp Deployed/Collected and other comments:																	
Survey #		Date		Location						Latitude (DD)				Photo Y / N					
										Longitude (DD)				Weather					
Habitat [Barren Crop/Ag DecidWoodland ConifWoodland Herbaceous HerbWetland IntroHerbVeg MixedUplandWetland RecentBurnForest Shrubland SteppeSavannah WoodyWetland]																			
Recorder ID		Time/Temp Deployed/Collected and other comments:																	

[illegible]

[illegible]

VOUCHER TAGS

Location:				Location:			
Lat/Long (DD):				Lat/Long (DD):			
Date:		Survey #:		Date:		Survey #:	
Collector:		Trap Type-Station #:		Collector:		Trap Type-Station #:	
Voucher #:	10DM-00573	Habitat:		Voucher #:	10DM-00574	Habitat:	
Location:				Location:			
Lat/Long (DD):				Lat/Long (DD):			
Date:		Survey #:		Date:		Survey #:	
Collector:		Trap Type-Station #:		Collector:		Trap Type-Station #:	
Voucher #:	10DM-00575	Habitat:		Voucher #:	10DM-00576	Habitat:	
Location:				Location:			
Lat/Long (DD):				Lat/Long (DD):			
Date:		Survey #:		Date:		Survey #:	
Collector:		Trap Type-Station #:		Collector:		Trap Type-Station #:	
Voucher #:	10DM-00577	Habitat:		Voucher #:	10DM-00578	Habitat:	
Location:				Location:			
Lat/Long (DD):				Lat/Long (DD):			
Date:		Survey #:		Date:		Survey #:	
Collector:		Trap Type-Station #:		Collector:		Trap Type-Station #:	
Voucher #:	10DM-00579	Habitat:		Voucher #:	10DM-00580	Habitat:	
Location:				Location:			
Lat/Long (DD):				Lat/Long (DD):			
Date:		Survey #:		Date:		Survey #:	
Collector:		Trap Type-Station #:		Collector:		Trap Type-Station #:	
Voucher #:	10DM-00581	Habitat:		Voucher #:	10DM-00582	Habitat:	
Location:				Location:			
Lat/Long (DD):				Lat/Long (DD):			
Date:		Survey #:		Date:		Survey #:	
Collector:		Trap Type-Station #:		Collector:		Trap Type-Station #:	
Voucher #:	10DM-00583	Habitat:		Voucher #:	10DM-00584	Habitat:	
Location:				Location:			
Lat/Long (DD):				Lat/Long (DD):			
Date:		Survey #:		Date:		Survey #:	
Collector:		Trap Type-Station #:		Collector:		Trap Type-Station #:	
Voucher #:	10DM-00585	Habitat:		Voucher #:	10DM-00586	Habitat:	
Location:				Location:			
Lat/Long (DD):				Lat/Long (DD):			
Date:		Survey #:		Date:		Survey #:	
Collector:		Trap Type-Station #:		Collector:		Trap Type-Station #:	
Voucher #:	10DM-00587	Habitat:		Voucher #:	10DM-00588	Habitat:	
Location:				Location:			
Lat/Long (DD):				Lat/Long (DD):			
Date:		Survey #:		Date:		Survey #:	
Collector:		Trap Type-Station #:		Collector:		Trap Type-Station #:	
Voucher #:	10DM-00589	Habitat:		Voucher #:	10DM-00590	Habitat:	
Location:				Location:			
Lat/Long (DD):				Lat/Long (DD):			
Date:		Survey #:		Date:		Survey #:	
Collector:		Trap Type-Station #:		Collector:		Trap Type-Station #:	
Voucher #:	10DM-00591	Habitat:		Voucher #:	10DM-00592	Habitat:	
Location:				Location:			
Lat/Long (DD):				Lat/Long (DD):			
Date:		Survey #:		Date:		Survey #:	
Collector:		Trap Type-Station #:		Collector:		Trap Type-Station #:	
Voucher #:	10DM-00593	Habitat:		Voucher #:	10DM-00594	Habitat:	

